

WHAT IS CLAIMED IS:

1. A method for recovering useful components in an electrolytic phosphate chemical treatment bath, wherein, by contacting a metal material article having electrical conductivity with a phosphate chemical treatment bath and by subjecting the metal material article to be treated to electrolytic treatment in said phosphate chemical treatment bath, a film containing a phosphate compound is formed on the surface of said article to be treated, and then the treated article having phosphate chemical treatment liquid adhered thereto after chemical treatment is contacted with an aqueous solution for dilution and washing, characterized in that:

(a) a phosphate chemical treatment bath which contains phosphate ions and phosphoric acid, metal ions that form a phosphate crystal to provide a film, metal ions that are reduced from cations in the solution to form a film as metals, and ions that are involved in the reaction of the above-mentioned phosphoric acid and various metal ions to form a film, but which does not substantially contain ions that are not involved in film formation, is used as the phosphate chemical treatment bath, and

(b) the aqueous solution in the washing water tank with which phosphate chemical treatment liquid adhered to the treated article after chemical treatment is contacted for dilution and washing, is subjected to electrodialysis, and useful components in said aqueous solution is thereby recovered and returned to the chemical treatment bath.

2. A method according to claim 1, wherein the ions that are involved in the reaction of the above-mentioned phosphoric acid and various metal ions to form a film, are nitrate ions and/or fluoride ions.

3. A method according to claim 1, wherein the oxidation-reduction potential (ORP) (expressed as potential relative to a standard hydrogen electrode) of

the phosphate chemical treatment bath is maintained at 770 mV or higher.

4. A method according to claim 1, wherein the oxidation-reduction potential (ORP) (expressed as potential relative to a standard hydrogen electrode) of the phosphate chemical treatment bath is maintained at 840 mV or higher.

5. A method according to claim 1, wherein aqueous solution of phosphoric acid is used as the electrode solution.

6. A method according to claim 1, wherein the useful components include film components consisting of phosphate ions and phosphoric acid, nitrate ions, and metal ions forming a complex with phosphate ions in the phosphate chemical treatment bath.

7. A method according to claim 6, wherein the useful components further include ions involved in film formation.

8. A method according to claim 7, wherein the ions that are involved in film formation are fluoride ions used in the case where aluminium is used for metal material article to be treated.

9. A method according to claim 1, wherein the useful components are added to the phosphate chemical treatment bath and reused.

10. A method according to claim 1, wherein electrodialysis is performed by introducing the aqueous solution of the washing water tank used for dilution and washing into an electrodialysis tank.

11. A method according to claim 10, wherein the aqueous solution of the washing water tank used for dilution and washing is diluted by a factor of ten or more with water from the phosphate chemical treatment bath after chemical treatment.

12. A method according to claim 10, wherein the electrodialysis tank has multi-cell structure with anion exchange membranes and cation exchange membranes being

alternately combined.

13. A method according to claim 10, wherein
electrodialysis is performed with transmembrane voltage
of the electrodialysis tank not higher than the
5 dissociation voltage of water.

14. A method according to claim 12, wherein the
electrodialysis tank is further provided with an
electrode solution tank for containing electrode solution
and a shut-off tank disposed adjacent to the electrode
10 solution tank for preventing ions subjected to
electrodialysis from permeating into the electrode
solution tank.

15. A method according to claim 10, wherein
concentrated water having ions concentrated by
15 electrodialysis is returned to the phosphate chemical
treatment bath.

16. A method according to claim 15, wherein the ion
concentration factor is in the range of 10 ~ 1000.

17. A method according to claim 10, wherein diluted
20 water having ions diluted by electrodialysis is used for
dilution and washing of the phosphate chemical treatment
bath after chemical treatment.

18. A method according to claim 17, wherein the ion
dilution factor is in the range of 10 ~ 1000.